



Materials Engineering Branch

TIP*



No. 115 Printed Wiring Board Coupon Examination

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Multilayer printed wiring boards (PWBs) are often used in critical applications where complex circuitry must be densely packed into a small volume. Because of the nature of their construction, it is not possible to inspect the internal layers of the finished board by means of an external visual examination. In particular, the junctions between the traces and the plating of the plated through holes (PTHs) (See Fig.1). Electrical performance cannot be fully checked out until the board is populated and a board failure at this point can result in the loss of components which may be difficult to replace in a timely fashion. In addition, many of the defects are latent in nature, and do not become apparent until the board has been stressed, usually by long-term thermal cycling.

Both the military (MIL-P-55110) and the NASA (S312-P-003) specifications require the construction integrity of the board to be judged by the cross sectioning and examination of a set of PTHs that is included on the board production panel for this purpose. This coupon is processed integrally with the board, and the PTHs are presumed representative of those on the rest of the board. The coupon is cut off and examined after all fabrication steps have been completed.

Difficulties with this inspection technique arise from the fact that the procedures are not readily quantified and rely equally on the skill of the person preparing the metallographic test specimens and the subjective judgment of the inspector. In many cases, faulty boards have been delivered because the vendor's inspection was not properly carried out or the cross sections were so poorly prepared that the defects could not be seen.

It is important, therefore, to have incoming inspection performed on coupons representing multilayer boards, or at least to review the coupons prepared by the manufacturer. Boards purchased to either the military or NASA specification will have such coupons.

NASA Reference Publication 1161, "Evaluation of Multilayer Printed Wiring Boards by Metallographic Techniques," May 1986, has been prepared as a guide to the preparation and inspection of PTH test coupons.

Figure 1.
Illustration of a printed circuit board that shows
internal defects that are visible only in cross-section.

Figure 1-A. Top view of a printed circuit board,
showing the location of a cross-sectioning cut.

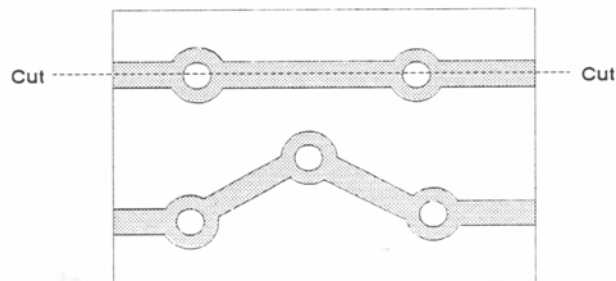


Figure 1-B. Plane of cross-section, showing
internal defects.

